

LITHOLOGIC LOG

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LOCATION MAP:

BLM-21-400

BLM-25-455

Well Road

NORTH

SE 1/4 SE 1/4 SE 1/4 NW 1/4 S32 T20S R3E

SITE ID: NASA-WSTF

LOCATION ID: BLM-25-455

SITE COORDINATES (ft.):

N 226364.74

E 407531.42

GROUND ELEVATION (ft. MSL): 4619.42 (B.C.)

STATE: NEW MEXICO

COUNTY: DOÑA ANA

DRILLING METHOD: Mud Rotary/Air Foam Rotary

DRILLING CONTR.: Larson Drilling Co.

DATE STARTED: 09/19/91

DATE COMPLETED: 10/23/91

FIELD REP.: D. Menzie, M. Canavan

COMMENTS: 0'-68' mud rotary (12 $\frac{1}{2}$ " mill tooth bit; reamed to 16"), 10" surface casing to 68'. 68'-494' air/foam rotary (9 7/8" mill tooth bit). Tuff bedrock at 365'. Total Depth (TD) = 494'.

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
5	000000000++	0'-68' Timed by driller	90	0'-365' Cuttings (0'-494')	Alluvium (Santa Fe Group): Cutting samples consist of multicolored clasts with clay-rich intervals colored light brown (5 YR 6/4) to moderate brown (5 YR 4/4). Cuttings range in size from much less than 0.1" (clay and silt size) to 1.6" and average 0.1 to 0.2". Cuttings are rounded to angular. Rounded and subrounded cuttings are formation grains and comprise 10%-50% of individual samples. Angular and subangular grains include blocky formation clasts and chips broken during drilling. The alluvium is an unconsolidated to moderately consolidated, poorly sorted, pebble to boulder, polygenetic conglomerate. Intermittent clay and caliche-rich intervals are noted in the log. Cutting clasts representing various lithologies occurring in the alluvium are light gray (N7) to grayish-black (N2) limestone, white (N9) iron-stained rhyolite, moderate reddish-brown (10 R 4/6) to dusky red (5 R 3/4) and greenish gray (5 GY 6/1) siltstone, dusky brown (5 YR 2/2) sandstone, white (N9) to light gray (N7) quartz, grayish pink (5 R 8/2) to moderate pink (5 R 7/4) caliche, blackish red (5 R 2/2) andesite and dark brownish red (10 R 3/4) to pale red purple (5 RP 6/2) tuff. Tuff and andesite gradually replace rhyolite as the principle volcanic clast with increasing depth.
10	+++VVV//D	236			
15	++HVVVVV//D	12			
20	HHHVVVVV//D	11			
25	VVVVVV++//D	32			
30	HHHVVVVV//D	30			
35	HHHVVVVV//D	23		0'-10'	Took 4 hours to drill through caliche layer with only bit and kelly for drawdown weight. Penetration rate increased with stabilizer on. Cutting clasts range in size from 0.1" to 0.5" and average 0.2", cuttings rounded to angular.
40	HHHVVVVV//D	28		10'-35'	Cuttings size increases to 0.5" average, range from 0.1" to 1.2".
45	HHHVVVVV//D	45		35'-45'	Clay-rich interval, clay content 20%-40%.
50	HHHVVVVV//D	32		35'	Cuttings size decreases to average of 0.2".

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
50			32	Cuttings (cont'd)	
55			27		55'-60' Clay-rich interval, clay content ≥ 20%.
60			44		
65			15		65'-75' Sample contains 30% to 60% grout. Visual % lithology is for formation clasts.
70		(to 68')	55		68' Switch to air foam rotary drilling with 9 7/8 " mill tooth bit.
		Timed by drillograph	11		70'-75' 10% clay.
80			9		
85			20		85'-110' 10% - 20% clay.
90			4		
95			4		
100			4		
105			4		
110			6		
115			4		

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
				Cuttings (cont'd)	
115	+ + + + + V V N		4		115'-135' Clay 10% to 20%.
120	+ + + + V V N		4		
125	+ + + + V V N = =		6		
130	+ + + + V V N = =		5		
135	+ + + + V V N = =		5		
140	+ + + + V V V V N		10		
145	+ + + + P + V V V V		11		
150	+ + + + P + V V V V		5		
155	+ + + + V V V V		6		
160	+ + + + + V V V V		6		
165	+ + + + + V V V V		5		
170	+ + + + + V V V V		4		
175	+ + + + V V V V		3		
180	+ + + + V V V V		5		

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
180			5	Cuttings (cont'd)	
185			7		
190			10		
195			7		
200			11		
205			10		205'-215' Increase in drill times.
210			20		
215			34		
220			7		
225			6		
230			16		
235			13		227' Bit chatter.
240			10		
245			15		235' Volcanic fraction made up of 50% andesite and 50% rhyolite.

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
				Cuttings (cont'd)	
245	VVVVVV+H+//		15		
250	HHHHVVVVV//		16		
255	HHHHV+VVVV//		16		
260	+++VVVV//		15		
265	VVVVH+++//		12		
270	HHHHVVV//0%		18		
275	VVVVH++//0%		17		
280	VVNNVH++//0%		17		
285	VVVH++//0%		17		
290	VVNVH++//		21		
295	VVVVH++//0%		18		
300	VVVVVH++//		15		
305	VVVVH++//0%		4		
310	VVVVVH++//		5		310' Foam changed color from tan to red.

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
				Cuttings (cont'd)	
310	VVVVVVVVHHH+		5		310'-365' <u>Volcanic-rich Alluvium (Santa Fe Group):</u> Samples range in color from brownish gray (5 YR 4/1) to moderate reddish brown (10 R 4/6). The volcanic-rich alluvium is a moderately consolidated, pebble to boulder conglomerate. Clast lithologies (in decreasing abundance) are; pale red purple (5 RP 6/2) to dark brownish red (10 R 3/4) tuff, blackish red (5 R 2/2) andesite, grayish black (N2) limestone, and lesser amounts of rhyolite, siltstone, and quartz.
315	VVVVVVVVHHH+		5		
320	VVVVVVVVHHH+		4		
325	VVVVVVVVHHH+		3		
330	VVVVVVVVHHH+		3		
335	VVVVVVVVHHH+		4		
340	VVVVVVVVHHH+		3		
345	VVVVVVVVHHH+		3		
350	VVVVVVVVHHH+		4		
355	VVVVVVVVHHH+		3		
360	VVVVVVVVHHH+		4		
365	VVVVVVVVHHH+		7		365'-410' <u>Crystal Vitric Tuff:</u> Pale red purple (5 RP 6/2) to dark brownish red (10 R 3/4) crystal vitric tuff contains up to 40% anhedral phenocrysts of plagioclase, quartz, and biotite. Cuttings average 0.2" and range in size from 0.1" to 0.75". Cuttings are subangular to rounded. Tuff clasts are soft and friable.
370	VVVVVVVVHHH+		5		
375	VVVVVVVVHHH+		5		

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
				Cuttings (cont'd)	
375	VVVVVVVVVVVV		5		
380	VVVVVVVVVVVVV		7	380'	Cuttings are 0.5" to 0.2" averaging 0.1". Range in color from brick red to pale gray purple. Quartz, biotite and feldspar are evident. Cuttings are soft and often rounded.
385	VVVVVVVVVVVVV		4	380'-385'	Cuttings increasing in size on average. Formation is very mottled in appearance. Similar to BLM-14 and BLM-13 bedrock. Biotite books up to 0.2". Phenocrysts may make up to 40% of rock with 40% quartz, 40% feldspar and 20% biotite. Formation is friable. Hematite possibly present.
390	VVVVVVVYVVVVV		4	385'-390'	Average cutting size = 0.2".
395	VVVVVVVVVVVVV		3	395'-400'	Many individual quartz grains present.
400	VVVVVVVVVVVVV		3		
405	VVVVVVVVVVVVV		3	405'-410'	Increase in purplish-white cuttings. Mottling of formation may be due to type of feldspar present. Brick red K-feldspar - grayish plagioclase (?) feldspar. Cuttings range in size from 0.1" to 0.75". Soft, friable well rounded. Still many individual quartz grains present. 50% brick red cuttings.
410	VVVVVVVVVVVVV		4	410'-494'	<u>Crystal Vitric Tuff:</u> Pale red purple (5 RP 6/2) to grayish blue (5 PB 5/2) crystal vitric tuff. Contains 30% - 50% phenocrysts of plagioclase and quartz with less than 5% mafic minerals. Cuttings range in size from 0.1 to 0.8". Cuttings are subangular to subrounded. Tuff clasts in this unit are harder and more competent than overlying red tuff.
415	VVVVVVVVVVVVV		5		
420	VVVVVVVVVVVVV		5	415'-420'	Decrease in percent of brick red cuttings. 75% soft, friable, platey, rounded purplish grey cuttings. Purplish cuttings apparently have some lithic fragments present, not evident in brick red formation. Increase in quartz and decrease in size of biotite books. Some brick red cuttings competent enough to be rhyolite.
425	VVVVVVVVVVVVV		6		
430	VVVVVVVVVVVVV		6		
435	VVVVVVVVVVVVV		6	435'-450'	Brick red cuttings absent. Grayish purple cuttings range from 0.1" to 0.8".
440	VVVVVVVVVVVVV		14		

Depth	Visual %	Lith	Drilling Time Scale: min	Sample Type and Interval	Lithologic Description
				Cuttings (cont'd)	
440	VVVVVVVVVVVVV		14		
445	VVVVVVVVVVVVV		7		445'-455' Drill times decreasing.
450	VVVVVVVVVVVVV		5		450'-465' Cuttings more competent. Up to 50% feldspar phenocrysts present. Mafic minerals not obvious.
455	VVVVVVVVVVVVV		6		
460	VVVVVVVVVVVVV		6		
465	VVVVVVVVVVVVV		11		465'-494' Drill times increase significantly.
470	YVVVVVVVVVVVV		20		
475	VVVVVVVVVVVVV		24		470'-490' Cuttings are hard and platey. Hematite stains due to weathered mafic mineral. Clear plagioclase feldspars most apparent and make up 30% - 50% of rock. Mafic minerals comprise is < 5%. Quartz also present, but difficult to distinguish in hand specimen from plagioclase.
480	VVVVVVVVVVVVV		25		
485	VVVVVVVVVVVVV		29		
490	VVVVVVVVVVVVV		34		
495	VVVVVVVVVVVVV		24		TD = 494' (from drillograph)
500					
505					